Appl. No.: 09/727,032
Amdt. dated S pt mb r 25, 2003
Reply to Offic acti n of July 8, 2003

Amendments to the Specification

Please replace the title with the following amended title:

~~Adaptive~~ Bus ~~Arbiter~~ Access Arbitration Based on Workload.

Please replace the paragraph beginning at page 9, line 22, with the following rewritten paragraph:

As shown in Figure 2, each of the bus devices 110, 120, 130 preferably connect electrically to the bus 150. According to the preferred embodiment, the bus devices 110, 120, 130 also transmit a grant request (~~GRANT~~REQUEST) signal and a workload (WORKLOAD) signal to the bus arbiter 100, and receive a grant (GRANT) signal from the bus arbiter 100. Although shown separately for purposes of illustration, any one or all of these signals may comprise part of the bus 150. Alternatively, any one or all of these signals may comprise a separate sideband signal connected individually between each bus device 110, 120, 130 and the bus arbiter 100.

Please replace the paragraph beginning at page 10, line 6, with the following rewritten paragraph:

In accordance with standard convention, the request signal is transmitted by any bus device whenever that bus device is ready to access the bus. Thus, according to the present invention, any of bus devices 110, 120, 130 transmit a request (REQUEST) signal to the bus arbiter 100 when one or more entries is pending in the associated queue 115, 125, 135. Similarly in accordance with normal convention, the bus arbiter issues a grant signal to one of the bus devices to indicate that the requesting device has been granted mastership of the bus. Thus, as shown In Figure 2, bus arbiter 100 transmits a (GRANT) signal to one of the bus devices 110, 120, 130 indicating that one of the bus devices has been granted mastership of bus 150.

Please replace the paragraph beginning at page 11, line 8, with the following rewritten paragraph:

A3

As one skilled in the art will understand, no entry is needed for zero entries in the queue, because in that event the WORKLOAD signal is a don't care condition ~~because~~ and no REQUEST signal will be asserted. Various other encoding schemes may be used, and fewer or more bits may be used to indicate queues of different sizes. Thus, queues that can only hold two entries may be encoded with one bit, while queues that may hold 5, 6, 7 or 8 entries may be encoded using three bits, as follows:

Please replace the paragraph beginning at page 11, line 16, with the following rewritten paragraph:

A4

Instead of using discrete values, ranges also may be used. Thus, for example, a value of 11 for the WORKLOAD signal may be used to indicate 4 or more entries are pending in the queue. This technique may be used to minimize the number of bits required to indicate the number of entries pending in the queue. Furthermore, it will be appreciated that queues of different sizes may be used in the bus devices, with a coding scheme that ~~does~~ represents the number of entries, or range of entries, that are available in each queue.

Please replace the paragraph beginning at page 12, line 4, with the following rewritten paragraph:

A5

Thus, as a first example in which each of the bus devices 110, 120, 130 have queues 115, 125, 135 that are four or more entries deep, consider that bus devices 110, 120, 130 all submit a bus request substantially simultaneously, and bus device 110 has one entry in the queue 115, bus device 120 has two entries in queue 125, and bus device 130 has four entries in queue 135. In that event, each of the bus devices 110, 120, 130 will transmit a REQUEST signal substantially simultaneously to bus arbiter 100. In ~~each~~ addition, each of the bus devices 110, 120, 130 also will transmit a WORKLOAD signal, indicating the number of operations pending in the queue. Thus, because each of the devices

in this example have a different number of operations pending in the associated queue, each bus device will transmit a WORKLOAD signal with a different value. In this example, bus device 110 may assert two logic level low signals (a 00) on the two bus lines, while bus device 120 asserts a 01, and bus device 130 asserts a 11 on the two signal lines. From this, the bus arbiter 100 preferably selects bus device 130 because that device has the greatest workload.